



## CHAPTER 2

**Information Technology Revolution in  
the Republic of Korea:  
Rise of the Knowledge-Based Society***Alexandre Y. Mansourov***Historical Background**

It took the Republic of Korea only two decades to revolutionize its telecommunications industry and change the lives of an entire generation of consumers. Prior to the 1980s, as the military governments pursued the export-led industrialization strategy, domestic service industry, including the telecommunications market, was by and large ignored: telecommunications facilities were worn out, there was a chronic imbalance between the supply and demand in telecommunications services sector resulting in notoriously poor quality of service and a constant backlog of households and organizations seeking to subscribe to a fixed-telephone line.<sup>1</sup>

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<sup>1</sup> According to Dr. James Larson, at the end of 1981, there were just 3.25 million fixed line customers for a telephone penetration rate of 9.3 per 100 homes in South Korea. See James Larson, *Telecommunications Revolution in Korea*, Hong Kong: Oxford University Press (China), 1995.

However, the situation began to change radically in the early 1980s when public demand for improved quality of life and better communications services became overwhelming as a function of the overall economic growth, extraordinary and sustained investment in higher education, the government's strong initiatives (especially, the 1986 Asian Games and the 1988 Seoul Olympic Games), and widening democratization movement. In response to the domestic consumer demand and international market pressures, the government decided to liberalize the telecom industry, by spinning off and privatizing the telecommunications businesses in the short and medium term and opening up the telecommunications sector to foreign competition in the long run.

As part of its fifth five-year economic development plan that set forth the goal of "increasing the number of fixed lines to six million and enhancing the communications infrastructure in remote areas," in January 1982, the Ministry of Communications spun off the Korean Telecommunication Authority, the precursor of Korea Telecom, and made it a fully government-funded public corporation with responsibility for all telecommunications businesses, except data communications. The KTA was also empowered to manage all institutional affairs, ranging from the provision of telecommunications services to drafting regulations and policies. The establishment of the KTA was soon followed by a wave of reorganizations of other government-owned or funded communications businesses, including Dacom Corp., 1982, the National Computerization Agency, 1987, the Korea Mobile Telecommunications Co., 1984, the Electronics and Telecommunications Research Institute, 1985, the Korea Telecom International, 1986, and the Information Culture Center of Korea, 1988. While investing heavily in the construction of efficient and modern switching and cable

facilities in the process of preparations for the Seoul Olympic Games, within the first five years of its inception, the KTA was able to achieve its goal of placing a phone in every household (six million in total) and offering instant subscription services for customers even in the most remote areas, so that “anyone can make a phone call anywhere in 1987.” All in all, it took the KTA six years and 6.7 trillion won in investment to bring automation to all local, long-distance, and international fixed-line telephone services all around the nation.<sup>2</sup>

In order to respond flexibly to customer needs, promote management efficiency, provide low-cost and convenient services to the public, and to cope more effectively with competition in the fast-changing global telecommunications markets, the ROK government decided to privatize the KTA under the name of Korea Telecom in 1990: in 1993, the KT sold 10 percent of its shares in an initial public offering; consequently, from 1990 to 2000, through additional stock sales to the domestic investors, the sale of KT ADRs on Wall Street in 1999 and 2001, placements of Eurodollar bonds with warrants, and strategic alliances with foreign partners such as Microsoft, the government trimmed its stake in Korea Telecom to 28.4 percent, then totally eliminated it by selling its remaining shares to domestic investors in June 2002 and raising the foreign ownership of the company to 37.2 percent.<sup>3</sup> As a result of sweeping privatization and liberalization, the telecommunications sector experienced a tremendous influx of foreign and domestic investment funds and grew at an annual rate of 28.6 percent for two decades, more than double the overall economic growth, shifting from landline

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<sup>2</sup> See Kim Deok-hyun, “Telecom Industry Undergoes Revolutionary Change in Two Decades,” *Korea Times*, Seoul, November 22, 2002.

<sup>3</sup> See Kim Deok-hyun, “Making Rapid Transitions to Advanced Telecommunications,” *Korea Times*, Seoul, November 22, 2002.

and voice to wireless and data services (including the broadband Internet), with revenues from mobile phones having surpassed revenues from fixed-line phones.

Since the mid-1990s, the Korean government has set out two master plans for the development of the information society, the First Master Plan for Informatization [sic] Promotion in 1996 and the Second Master Plan called “Cyber Korea 21” in 1999, aimed at building a knowledge-based society.<sup>4</sup> As a result, at the end of 2002, more than 68% of the population was hooked up to the Internet; 68% of all Koreans used mobile phones; and 70% of all households subscribed to the broadband Internet. Korea stands out as a country with one of the most advanced IT infrastructures on the planet. Korean IT industry has become a key-driving engine of the national economic growth, generating 16% of the country’s GDP and US\$ 57.6 billion or 37.1% of its exports in 2003.

The digital revolution in Korea has passed the stage of capacity-building (more and sleeker IT equipment with larger memories and faster speed, wider access, broader and deeper content) and entered a new stage facilitating ubiquitous connectivity and convergence of services and contents between wired and wireless as well as broadcasting and telecommunications.

In addition to profound economic impacts on national manufacturing, trade balance, patterns of retail and wholesale trade, resulting from the spread of IT, e-commerce, and m-commerce, the IT revolution has had tremendous social impacts on the Korean society, bridging the generational and regional gaps, revolutionizing the way

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<sup>4</sup> See “*White Paper: Internet Korea 2003*,” National Computerization Agency, Ministry of Information and Communication, Seoul, ROK, July 2003, p. 2.

the Korean government serves its citizens via the e-Government programs,<sup>5</sup> creating a new political culture of netizens campaigning for political candidates via the Internet, and creating a ubiquitous connectivity environment around the entire country.

Today, the Republic of Korea is a recognized global IT leader. The Third Master Plan<sup>6</sup> for Informatization Promotion (2002-2006), titled “e-Korea Vision 2006” and adopted by the ROK Ministry of Information and Communication in April 2002, envisions three basic policy directions in further development of the knowledge-based society in the ROK: (1) a shift from quantitative expansion of the Internet to qualitative accomplishments such as the increase in productivity through legal and institutional reforms and innovations in business practices; (2) a shift away from direct governmental support for the creation of new industries to focus on upgrading the information infrastructure, supporting venture startups, R&D, and human resource development in order to form a foundation on which new industries can be created by the private sector; and (3) a shift from the catch-up strategy to the leading strategy whereby the government will increase its seed investments in core technologies and strategic services which have the potential to generate significant added value in the future. The future information society in Korea is expected to increase the effectiveness of all socio-economic activities, including the establishment of such new knowledge-intensive industries as biotechnology, nanotechnology, cell technology, ecology-friendly technology, and space technology, which will help sustain

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<sup>5</sup> See “*Changing Korea with E-Government*,” Ministry of Information and Communication, Seoul, ROK, pp. 1-19, at [www.egov.go.kr](http://www.egov.go.kr).

<sup>6</sup> See “*E-Korea Vision 2006: The Third Master Plan for Informatization Promotion (2002-2006)*,” Ministry of Information and Communication, Seoul, ROK, April 2002, pp. 21-22.

robust economic growth and a higher quality of life for generations to come.

### **Trends in Production, Domestic Sales, and Imports/Exports in IT Industry**

Traditionally, the IT industry in Korea has been classified into three main sectors – the telecommunications-services sector, the IT equipment sector, and the software sector. At the end of 2002, the telecommunications-services sector constituted 20.22% of the overall IT production and combined the facilities-based telecom services, including wired (local, domestic long-distance, and international) and wireless (cellular and PCS) telephone services, resale services, value-added services such as the Internet, and broadcasting services. The IT equipment sector constituted 74.21% of the entire IT production, reflecting a strong manufacturing bias of the Korean economy, and combined the manufacturing of information equipment (computers, printers, scanners, monitors, etc.), communications equipment (telephones, mobile phones, and networking equipment), broadcasting equipment (satellite video receivers), and electronic components (for instance, semiconductors and liquid crystal displays). The software sector represented only 5.57% of the overall IT production and included the development of packaged software (for example, word processing programs, spreadsheets, graphics and design) and the computer-related services for information management business (data security, network assurance, etc.).<sup>7</sup>

#### *Telecommunication Services Sector*

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<sup>7</sup> See “*IT Industry Outlook of Korea 2002*,” Korea Information Society Development Institute, Seoul, ROK, pp. 9-10.

Telecommunications services doubled their revenues from US\$ 11.4 billion in 1996 to US\$ 22.9 billion in 2000, displaying a very robust average annual growth rate of 19.1 percent during the five-year period from 1996 to 2000. Specifically, the facilities-based telecom services grew from US\$ 8.7 billion to US\$ 16.3 billion at an average annual growth rate of 15.3 percent, whereas the value-added communication services and broadcasting services grew from US\$ 0.4 billion and US\$ 2.3 billion to US\$1.9 billion and US\$ 4.1 billion respectively at an average annual growth rate of 47.6 percent and 15.5 percent over the period of 1996-2000.<sup>8</sup>

In both local and long-distance markets, the wired telecom services reached the saturation point at 25,408,044 fixed-line telephone service subscribers in 2002: 22,549,840 – local service subscribers, 2,148,094 long-distance, and 340,800 international telephone service subscribers.<sup>9</sup> Their sales and profits continue to decline at 7.7 percent annually, despite greater marketing costs, and are projected to generate just 11.1 trillion won in 2008 as compared to 10.8 trillion won in 2003, due to growing substitution by wireless services and commercialization of VoIP, or free Internet phone service. In order to boost sales, increase the number of calls, and improve profitability in a stagnant market environment, the government began to deregulate the wired telecom services by encouraging private competition in April 1999. However, as of June 2004, KT, with 11.6 trillion won in revenue and 830 billion won in net income in 2003, still controls 95 percent of the local fixed-line market, 84 percent of the long-distance market, and 57

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<sup>8</sup> Source: Korea Association of Information and Telecommunication, Seoul, ROK.

<sup>9</sup> Source: Korea Association of Information and Telecommunication, *Survey on the Current Trends in the IT Industry*, Seoul, ROK, August 2002.

percent of the international telephone service.<sup>10</sup> Despite the introduction of the fixed-line number portability on January 1, 2004, Hanaro Telecom was able to muscle away only 4.8 percent of the local telephone service from KT, while Dacom and Onse Telecom succeeded in gaining only 13 percent and 2.7 percent of the long-distance telephone service market and 30 percent and 13 percent of the international telephone market, respectively.<sup>11</sup>

In 1998, the wireless telecom services overtook the wired telecom services as the largest revenue-generating engine in the telecom-services sector, as Figure 2.1 indicates below.

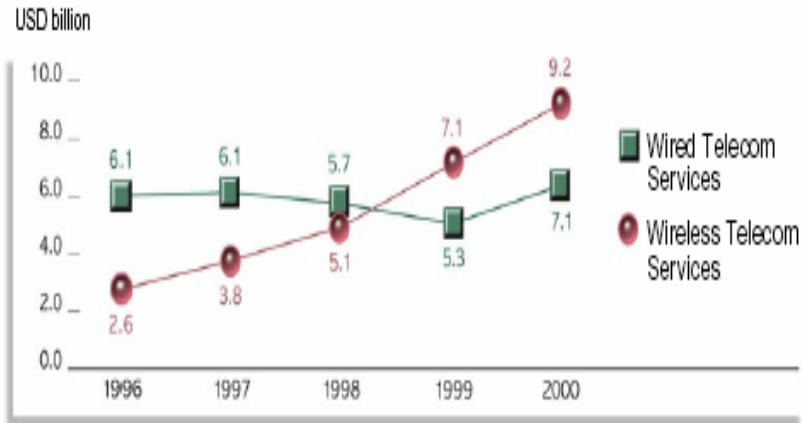
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<sup>10</sup> “KT Reports W3.3 trillion Revenue in Second Quarter,” *The Korea Herald*, Seoul, ROK, August 7, 2004

<sup>11</sup> “Hanaro Guns for Greater Sales,” *The Korea Herald*, Seoul, ROK, June 24, 2004



**Figure 2.1. Revenues from wired and wireless telecom services**



The wireless telecommunications service is projected to continue its decade-long double-digit growth, which propelled it to the current maturity stage, and to expand at about 20 percent per annum to 32.3 trillion won by 2008 from 13.2 trillion won in 2003. In five years, it is expected to account for about three-fourths of the overall telecom market in Korea.<sup>12</sup> At present, there are 35.5 million mobile phone users in the ROK (their number is expected to reach 39 million by 2008): in other words, seven out of ten Koreans use a cellular phone. The three-company market competition in wireless services is fierce, especially with the elimination of the handset subsidy, permission of number portability in 2004, and shift to the third-generation

<sup>12</sup> "Mobile to Capture 74% of Telecom Biz of Korea," *The Korea Times*, Seoul, ROK, June 13, 2004

wireless technology and IMT-2000 standard.<sup>13</sup> As of July 1, 2004, the cellular service provider SK Telecom, the market leader in terms of sales, revenues, and net income, has 18.5 million subscribers and still controls 51.6 percent of the market, despite the government-imposed ceiling of 50 percent on its market share; KT Freetel (a PCS provider) has 11.5 million subscribers and has a 32.7 percent share of the market; and LG Telecom (a PCS provider) has 5.5 million subscribers and controls 15.73 percent of the market.<sup>14</sup>

It is obvious that voice call growth hit saturation marks both in the wireless and fixed-line markets. But unlike the fixed-line, wireless has an alternative revenue stream of mobile contents and added services. The IDC Korea researcher Ha Ki-seok forecasts that wireless operators' revenues from non-voice services will emerge as a new growth engine by expanding 42 percent on average over the next five years. "With the number of new subscribers expected to remain flat, mobile carriers will focus on locking in the existing customers by providing highly-customized services and enabling mobile clients to savor various bundling features through convergence services via a single wireless device," Ha said.<sup>15</sup>

The first commercial Internet service in Korea was launched ten years ago in 1994. Since then, the number of Internet users surpassed one million in 1997, 10 million in 1999, 20 million in 2000 and, finally, in 2004, the Internet

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<sup>13</sup> "SK Market Share Falls," *The Joongang Daily*, Seoul, ROK, July 2, 2004

<sup>14</sup> "1.3 Million SKT Subscribers Switch Services," *The Korea Herald*, Seoul, ROK, June 22, 2004

<sup>15</sup> See Ha Ki-seok, "Korea Wireless Services 2004-2008 Forecast and Analysis: 2003 Year-End Review," IDC Korea, Seoul, ROK, June 2004, at <http://www.idckorea.com/>

population reached the 30.06 million people over the age of six, with the penetration rate exceeding 68.2 percent of the total population. The penetration rate exceeded 95 percent for people in their teens and 20s and reached 87 percent for people in their 30s; people in their 40s had a 58.3 percent penetration rate and the figure was 27.6 percent for those older than 50. The Internet penetration was greatest in the southern port city of Ulsan at 79.1 percent, followed by Gwangju at 76.3 percent and the Gyeonggi Province cities at 73.9 percent; Seoul had a 72.8 percent penetration rate; whereas the mid-western regions of South Chungcheong and South Jeolla showed the lowest penetration rates in the nation at below 55 percent.<sup>16</sup>

With the Internet market nearing a saturation point in terms of the number of the Internet users, its annual growth rate continued to decline from 75.3 percent in 2000 to 11.2 in 2003 and to 2.7 percent in the first six months of 2004. Although the penetration rate is still rising, the average Korean spent fewer hours using the Internet compared to 2003 due to a sluggish economy and the implementation of the five-day workweek. According to the Ministry of Information and Communication, the average Internet user spent 11.5 hours per week in front of the monitor, a slight drop from 12.2 hours in 2003. More than 86 percent of the users had an e-mail account and 45.2 percent were registered at online communities run by portal sites. More than 73 percent of users picked data searches as their primary online activity, followed by computer games at 54 percent and e-mail access at 33 percent. About 14 percent of the respondents said they shopped online and 26 percent said they took advantage of online banking. However, the use of paid services remained relatively low, with only 18.9

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<sup>16</sup> Kim Tong Hyung, "Korean Internet Population Reaches 30 Million," *The Korea Herald*, Seoul, ROK, August 11, 2004

percent of users saying they pay for content. More than 65 percent of the respondents said they have a negative view of the expansion of paid services.<sup>17</sup>

More than 84 percent of Internet household users, or almost 25 million people, rely on high-speed digital subscriber lines for Internet access, while 11.6 percent (or 3.5 million people) use cable, and 2.4 percent, or 720 thousand people, use fixed-line modems. According to the International Telecommunication Union, Korea is ranked as the number one country in the world in terms of the penetration rate measured as the number of Internet users per population at 68 percent, ahead of Iceland's 67.5 percent and Sweden's 63.8 percent, and in the high-speed Internet (broadband service) sector.

At present, KT controls 51 percent of the broadband Internet market, whereas the Hanaro Telecom and Thrunet control 24 percent and 18 percent, respectively, with the rest of the market occupied by Dacom, Korea Dreamline, Korea Cacom, and other telecom carriers and cable operators subject to numerous alliances and M&A activities. Despite their spectacular growth in the past five years, all Korean Internet access service providers demonstrate low profitability and poor cash flow due to excessive initial investment in building capacity, high marketing expenses, and exceptionally low subscription rates, which put a heavy burden on further market expansion and commercial viability of some of the high-speed Internet service carriers.<sup>18</sup>

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<sup>17</sup> "The Realities of Informationization in the First Quarter of 2004," public opinion survey, Ministry of Information and Communication and Korea Network Information Center, Seoul, ROK, June 2004

<sup>18</sup> See "IT Industry Outlook of Korea 2002," Korea Information Society Development Institute, Seoul, ROK, December 2002, pp. 51-53

Convergence, involving the integration of different types of networks (voice and data integration via the Internet telephony, next-generation convergence network), “bundling” of services (Internet telephony on wireless network, or IPToW), and interface convergence (satellite digital multimedia broadcasting), is one of the trends of the future in the telecommunications services. For instance, in early 2004, as part of its “IT 839 strategy,” aimed at promoting the core technologies for the next generation communications, the ROK government decided to establish a nationwide broadband convergence network, designed to provide Internet access at speeds of 50Mbps to 100Mbps with nationwide coverage, to serve as the backbone for IPv6, radio frequency identification technology, and other developing communication solutions, that could allow communication to blend with broadcasting. According to the MIC plans, broadband convergence networks are expected to generate 111 trillion won in novel IT equipment sales and additional US\$ 50 billion in exports by 2010, while covering more than 20 million Korean households.<sup>19</sup>

Ubiquity is another major trend that can reshape the economy and change the lifestyles of the Korean people within the next few years. In June 2004, the MIC Minister Chin Dae-je unveiled the “u-Korea Vision by 2007 through

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<sup>19</sup> The trial operations in 2005 are supposed to test voice-over-Internet and multimedia-over-Internet protocol services over the broadband convergence network, while also developing interactive solutions between digital television broadcasts and network computing. Fixed-line carriers KT Corp., Dacom Corp. and Hanarotelecom Inc., and mobile phone operator SK Telecom Co. are expected to take part in the trial operations of the broadband convergence network, together with such cable television operators as CJ Cable Net, OnMedia, and Taekwang MSO. For details, see Kim Tong Hyung, “Government to Grant BcN Trial Licenses,” *The Korea Herald*, Seoul, ROK, August 10, 2004.

the 8-3-9 strategy,” which is designed to bring Korea into the era of US\$ 20,000 per capita GDP. The u-Korea is short for ubiquitous Korea, referring to a futuristic environment that will offer uninterrupted access to the Internet, fixed-line and mobile networks any time and in any location, as a result of the implementation of the government-led “IT 8-3-9 Strategy.” The “IT 8-3-9 Strategy” stands for eight new IT services (WiBro service or portable Internet,<sup>20</sup> DMB service, home network service, telematics, RFID-based service, W-CDMA service, terrestrial digital TV, and VoIP), three new IT infrastructures (broadband convergence network, ubiquitous sensor network, and IPv6) and nine new IT growth engines (next-generation mobile communications, digital TV, home network, IT SoC, next generation PC, embedded SW, digital contents, telematics, and intelligent service robot).<sup>21</sup> It is a government action plan to attain the u-Korea vision by 2007. The strategy is aimed at creating 290,000 new jobs in the IT sector by 2007 and at expanding IT exports to US\$ 110 billion by the same period from US\$ 57.6 in 2003.<sup>22</sup>

### *IT Equipment Sector*

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<sup>20</sup> As the first step, by February 2005, the MIC is expected to choose from KT, SK Telecom, Hanaro Telecom, and Dacom two or three licensed operators for the WiBro portable Internet services identified as the next generation Internet service with a downstream speed of around 1 Mbps (mega bits per second) and seamless mobile connectivity at up to 60 kilometers per hour. For details, see Woo Byung Hyun, “MIC to Issue 2 or 3 WiBro Internet Service Licenses,” *The Chosun Daily*, Seoul, ROK, August 11, 2004.

<sup>21</sup> See “*The Road to US\$20,000 GDP/capita: IT 8-3-9 Strategy*,” Ministry of Information and Communication, Seoul, ROK, March 2004.

<sup>22</sup> See “Ubiquitous Korea to Become Reality,” *The Korea Times*, Seoul, ROK, June 9, 2004

IT equipment manufacturing is responsible for about three-quarters of the total production of the IT industry in Korea, with more than 55 percent of the IT equipment produced going overseas for exports. Table 2.1 shows the dynamics of the growth of IT equipment production by category, and Table 2.2 demonstrates the dynamics of the overall export/import trade in IT equipment in Korea.

**Table 2.1. Growth of IT Equipment Manufacturing in Korea (1996-2000)**

Category (US\$ billion)	1996	1997	1998	1999	2000	'96-'00 Average Growth Rate
<b>Total IT Manufacturing</b>	32.3	42.3	50.4	66.8	80.9	25.8%
<b>Communication Equipment</b>	6.9	10.6	11.0	15.4	16.7	24.7%
<b>Information Equipment</b>	4.9	7.5	8.2	12.1	15.3	32.9%
<b>Broadcasting Equipment</b>	1.2	0.4	0.6	0.7	1.2	0.0%
<b>Electronic Components</b>	19.3	23.7	30.7	38.7	47.7	25.4%

*Source: Korea Association of Information and Telecommunication*

**Table 2.2. Export/Import of IT Equipment by Korea (1998-2006)**

Item US\$ billion	1998	1999	2000	2001	2002	2003	2004	2005	2006	2000- 2006 <sup>23</sup>
Export	30.4	39.9	51.05	40.9	50.2	57.6	73.3	82.3	91.04	15.7%
Import	18.02	26.2	34.9	30.4	35.1	40.4	51.4	58.6	65.8	16.4%
Balance	12.4	13.7	16.1	10.5	15.1	17.2	21.9	23.7	25.2	13.9%

*Source: Data for 1998-2003 provided by Korea Association of Information and Telecommunication, "Information and Communication Industry Statistics Report" (April 2004), data for 2004 and thereafter are estimates provided by KISDI.*

### *Communication Equipment Sector*

The communication equipment sector generates 37 trillion 99.3 billion won (or US\$ 31.5 billion) in revenues and is expected to rise steadily at an average annual rate of 16.7 percent through 2008, because of increasing domestic demand for equipment for broadband networks and wireless Internet coupled with increases in domestic sales for 35.5 million local mobile phone users and booming exports of color screen and camera-embedded mobile handsets based on CDMA 2000 1x and GRPS standards to China, India, Vietnam, North and South America, as well as Europe. Exports of communication equipment (composed of mobile handsets - 67.3 percent of the total and broadband subscriber network related equipment – 32 percent of the total) rose to US\$ 18.43 billion in 2003 and are expected to rise at an average annual rate of 23.5 percent through 2008. Despite innovative pressures from

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<sup>23</sup> This is average annual growth rate in 2000-2006.



such global players as Nokia and Motorola and intensifying price competition in China, India, and Japan, Samsung Electronics and LG Electronics still dominate the global CDMA standard market, controlling 23.6 percent and 19.8 percent market shares, respectively. Exports of Korean made mobile handsets reached US\$ 12.41 billion in 2003 and are expected to rise 27.5 percent a year on average through 2008.<sup>24</sup>

### *Information Equipment Sector*

The information equipment sector generated 25 trillion won (or US\$ 21.2 billion) in revenues in 2003 and is projected to rise at an average annual rate of 10.9 percent through 2008, despite falling demand for desktop PCs caused by market saturation and extended lifecycles, and due to the rising demand for notebook computers and LCD monitors fueled by the proliferation of wireless communications and expansion of the storage device market like HDDs, DVD-ROM drives, and CD-RW drives. Despite a sharp decline in exports of desktop PCs and CRT (cathode ray tube) monitors in 2003, negatively affected by the war in Iraq, SARS, and flat demand in the U.S. and Europe, the main export markets for Korean made PCs, the overall exports of information equipment still rose only 11.6 percent to US\$ 10.5 billion, primarily thanks to increased international sales of Korean notebook computers and LCD monitors.<sup>25</sup>

### *Electronic Components Sector*

The electronic components sector rose to 78 trillion won (or US\$ 66.1 billion) in 2003, a 17 percent increase over 2002, encouraged by the steady recovery in DRAM prices

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<sup>24</sup> See "IT Industry Outlook of Korea 2004," Korea Information Strategy Development Institute, Seoul, ROK, July 2004, pp. 33-35

<sup>25</sup> *Ibid.*, pp. 36-38

after their 90% plunge in 2001 and continuing increase in the global market share of Korean DRAM manufacturers to 47 percent, as well as higher demand for LCDs as replacements for CRTs. Electronic components exports rose 16.5 percent to US\$ 25.9 billion in 2003, recovering almost entirely to the level of the year 2000 at US\$ 26 billion, despite increased geopolitical risks such as anxieties over the U.S. war in Iraq and North Korean nuclear crisis, the levying of countervailing tariffs against Hynix by the United States and European Union, and the overall downturn in the global telecommunication sector. Semiconductor production rose 19 percent to 36 trillion won (or US\$ 30.5 billion) in 2003, and Korean chipmakers exported nearly US\$ 20.0 billion worth of DRAMs, an increase of 19.3 percent over 2002, thanks to gradual recovery in DRAM prices resulting from the change in the flagship model from DRAM to DDR RAM. Since 1998, Korea has maintained its status as the largest DRAM manufacturing nation in the world, with Samsung Electronics and Hynix Semiconductor Inc. controlling 29.7 percent and 17.1 percent of the global DRAM market, respectively, at the end of June 2004.<sup>26</sup> But, because the share of semiconductor exports out of total exports is projected to increase only slightly at 9-10 percent annually, semiconductors can no longer serve as the major engine of growth for Korean exports as they were from 1995 to 2000.<sup>27</sup>

### *Broadcasting Equipment Sector*

The broadcasting equipment sector produces TFT LCDs, FPD, PDP, and projection TVs for the global display

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<sup>26</sup> See "Hynix Regains Spot as Number 2 Maker of Computer Memory Chips," *The Joongang Daily*, Seoul, ROK, July 29, 2004

<sup>27</sup> See "*IT Industry Outlook of Korea 2004*," Korea Information Strategy Development Institute, Seoul, ROK, July 2004, pp. 38-42

market<sup>28</sup> and digital camera equipment. As of July 2004, Samsung SDI and LG Philips LCD controlled over 45 percent of the global FPD with LCDs manufacturing market that is potentially worth US\$ 60 billion. Korea is projected to maintain the global lead in both the TFT-LCD and PDP markets through 2007. But intensifying international competition with Taiwanese flat panel makers, led by AU Optronics and Chi Mei Optoelectronics, and Matsushita of Japan, expanding their facilities and investment in fifth-generation production lines using organic light-emitting diodes, Korea's heavy reliance on foreign countries, mostly Japan, for core display technologies, components, and equipment, and the lack of ownership of intellectual properties and parts, which provide high added-value to the display industry, threaten Korea's ability to sustain its leadership position and overcome the projected supply glut by 2006.<sup>29</sup> Korea's local digital camera market stands at 1.2 million units. The only Korean digital camera maker, Samsung Techwin, has been waging a lonely competition against Taiwanese and Japanese players like Olympus, Sony and Canon since 2002, by selling around 340,000 units of digital cameras in 2003 (20 percent of them domestically) and planning to increase the sales figure to 600,000 units in 2004. LG Electronics also plans to enter the booming digital camera market soon in order to ride high on the mega trend of digital convergence.<sup>30</sup>

Korean IT equipment manufacturing facilities are

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<sup>28</sup> TFT LCD stands for thin-film-transistor liquid crystal displays, FPD stands for flat panel display, PDP stands for plasma display panel, and PTV stands for projection TV.

<sup>29</sup> See "Korea Will Maintain Display Market Leadership," *The Korea Herald*, Seoul, ROK, May 31, 2004

<sup>30</sup> See "Electronics Jumps Onto Digital Camera Bandwagon," *The Korea Times*, Seoul, ROK, July 1, 2004

concentrated mostly in Korea's three "Silicon Valleys" (near the cities of Daejeon, Gumi, and Cheongju) and two "Crystal Valleys" (in Cheonan-Tangeong and Paju). The largest "Silicon valley" is centered on Daedeok Science Town in Daejeon, which is a home for scientific research centers, high-tech venture companies, major chip manufacturing facilities, the Korea Advanced Institute of Technology, and the Korean Atomic Energy Research Institute.<sup>31</sup> The largest "Crystal Valley" encompasses two industrial complexes owned by Samsung Electronics in Cheonan and Tangeong, a 10-minute drive apart. The Cheonan complex was established in 1995 as a production zone for display panels. In the new 1,020-acre Tangeong Complex, Samsung Electronics will invest 20 trillion won (\$17 billion) until 2010 to set up four more LCD production lines, making seven in all, employing about 20,000 workers by 2010, generating sales of 10 trillion won a year, and thereby creating the world's biggest LCD manufacturing facilities. The Samsung's "crystal valley" will surpass in size the "Crystal Valley" built by LG Philips in Paju, Gyeonggi province.<sup>32</sup>

### *Software Development Sector*

The software development sector rose only 0.5 percent to 19.8 trillion won (or US\$ 16.8 billion) in 2003, a significant slowdown from the 33.7 percent growth rate in 2002, due to domestic economic downturn and market saturation. In fact, the packaged (enterprise) software market is expected to contract because most large-scale projects at major companies, financial institutions, and telecommunication service providers are almost completed.

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<sup>31</sup> See Chang Se-jeong and Wohn Dong-hee, "Silicon Valleys Planned for Korea," *The Joongang Daily*, Seoul, ROK, June 18, 2004

<sup>32</sup> See Wohn Dong-hee, "Samsung Begins Its Move to Korea's Crystal Valley," *The Joongang Daily*, Seoul, ROK, June 15, 2004

The growth of the computing service market (both system integration and system management) is expected to slow down due to the decline in public sector demand after the completion of the e-government system implementation project. The only exception to these negative trends is the Korean digital contents sector that has grown at an average annual rate of more than 50 percent since 2000, thanks to the expansion of the educational contents market and robust performance of the game market led by online games. Demand for high quality multimedia streaming and mobile contents is likely to be mitigated by conversion to paid services by local digital contents providers.

The Korean software development market is projected to grow to 36 trillion won (or US\$ 30.5 billion) by 2008 to account for over 3.5 percent of the global software market. Korean software industry exports rose to US\$ 578 million due to strong exports of computing services and digital content service, and the average annual growth rate is expected to be 25.6 percent from 2003 to 2008. But, Korea's still high dependency on imports of consumer and enterprise applications and system software solutions has become the main sources of software trade deficit.<sup>33</sup>

Because of the recent developments in the overall IT industry, Teheran Valley, the traditional hub of Korea's IT businesses and breeding ground for IT and Internet-related high-tech firms in southern Seoul concentrated between Kangnam subway station and the World Trade Center, is undergoing a major facelift these days. Companies doing business based on pure technology are being replaced by more profitable entertainment enterprises, such as game developers, mobile-content creators, and filmmakers. In

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<sup>33</sup> See "*IT Industry Outlook of Korea 2004*," Korea Information Strategy Development Institute, Seoul, ROK, July 2004, pp. 42-44

early 2004, two top corporate communications network providers abandoned Teheran Valley, followed by Locus Technology, Bridgetech, the Internet companies Dreamwiz, Inicis and Interpark, and Ahn Lab, a security-solutions developer. Since most of the tasks of these companies were performed online, they preferred not to pay the steep rents (at 15.2 million won (\$13,100) per square meter) of Teheran Valley and moved outside Seoul. Teheran Valley is changing along with the economy. It is no longer a valley of IT venture firms; it is a show valley where one can see which rising industries are making money at present. Its new renters include such companies as NHN, which runs an Internet game portal; a mobile game company Gretech; Nexon and NC Soft, major game developers; Neowiz, an online community and game provider; CJ Entertainment, a comprehensive entertainment group; CJ CGV, a multiplex cinema chain; and major film distributors and producers, such as Showbox, Megabox and Sidus.<sup>34</sup>

### **Overall Size and Performance of IT Industry**

Korean IT industry has played a leading role in the national economic growth since the early 1990s, despite two sector-wide recessions because of the economic downturns in 1997 and 2001. Since its recovery in 2002, the IT industry has grown at an average annual rate of 25.9 percent, surpassing the growth rate of Korea's GDP.

As of the year 2000, the added value of the Korean IT industry was estimated to be 89.9 billion PPP dollars,<sup>35</sup> ranking Korea the 7<sup>th</sup> after the United States among 24 comparable OECD countries. The share of the IT industry in Korea's GDP was estimated to be 16% as of 2003,

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<sup>34</sup> Wohn Dong-hee and Yoon Chang-hee, "Change Comes to IT Hub," *The Joongang Daily*, Seoul, ROK, June 10, 2004

<sup>35</sup> PPP stands for purchasing power parity used for international comparisons instead of standard exchange rates.

placing the ROK at par with Iceland and Finland. After a sharp fall in 2001 and dramatic IT exports recovery in 2002, Korea's IT industry exported US\$ 57.6 billion or 37.1% of its total exports in 2003, making it the third largest IT exporter in the world after the United States and Japan.

As of 2000, Korea's IT industry employed 436,000 workers (including 93,000 in telecommunications services, 280,000 in equipment manufacturing, and 62,000 in software development) out of the total labor force of 13,142,000 workers, or 3.32 percent, which is very low, considering the high value generated by the industry.<sup>36</sup> The IT industry is definitely a low labor input – high added value output industry.

Out of almost three million registered corporations in the ROK, as of 2001, there were about 18,464 companies in the IT industry, including 7,092 companies specializing in IT services, 6,042 companies engaged in IT equipment manufacturing, and 5,330 software development firms..<sup>37</sup> The number of IT companies grows at an average rate of more than 20 percent per year. Mushrooming venture start-ups offset increasing merger and acquisition activities in the IT industry.

### *Global Competitiveness of the ROK IT Industry*

The ROK's IT industry has a number of competitive advantages that enhance its international position and fuel its expansion on the global IT markets. These include the famous Korean know-how in mass production technology, Korean IT firms' experience in commercializing the first-

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<sup>36</sup> Source: *Korea Association of Information and Telecommunication*

<sup>37</sup> Source: *Korea Association of Information and Telecommunication*

ever CDMA technology, Korea's well-developed front-end industries, prompt decision-making regarding investment in high-tech, as well as high-quality, skilled manpower.

However, these strategic advantages are undermined by four important weaknesses that put in doubt the international position of the Korean IT industry. First of all, the LG Economic Research Institute warns that Korea's booming IT exports might stumble in the not-so-distant future if the nation continues its heavy dependence on imports of core components, parts, and raw materials. "If Korea doesn't nurture the IT parts industry and sticks to legacy processing trades, it will not be able to sustain current high-flying exports," said LGERI researcher Kim Yung-min.<sup>38</sup> From January to June 2004, Korea sold overseas \$36.5 billion in exports in the IT sector, up 47.1 percent from 2003, for a stunning \$16 billion surplus. However, these vigorous exports were based on offshore components, which accounted for four-fifths of total IT imports in the first six months of 2004. The ratio stood at 72.1 percent in 2000 but it has risen ever since to 76 percent in 2002 and 78.9 percent in 2003 before reaching 80 percent in 2004. As the ratios of the imported core components and parts surge, and profitability from complete products like panel displays and mobile handsets begins to fall, the long-term IT prospects tend to be undermined. The rate of foreign exchange earnings from the nation's IT exports plunged from 65.3 percent in 1995 to 54.2 percent in 2003, meaning that Korean firms pocketed a little more than \$54 per \$100 in overseas sales last year. It is obvious that Korea should invest more in developing a core-parts industry in order to remain ahead of the curve and pocket more of its IT-related foreign

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<sup>38</sup> See "Imports of IT Components Soar," *The Korea Times*, Seoul, ROK, July 26, 2004



exchange

earnings.

Second, heavy dependence on foreign core technologies and subsequent high spending for license fees also hurt the bottom line of Korean IT businesses. According to the Korea Industrial Technology Association, Korean companies paid a total of \$2.7 billion in technology fees to foreign companies in 2002. Of the total payments, 35 percent went to 10 foreign firms, including Qualcomm, which pocketed \$296 million in royalties. Qualcomm owns the source technologies for CDMA, the mobile telecommunications standard used in Korea, Japan, and elsewhere. IBM came in second, pocketing \$162 million in royalties from Korea; Microsoft took third place with \$122 million. Texas Instruments, a company specializing in real-time technology, received \$95 million, while Motorola took in \$87 million for its products. Most of the royalties were for source technologies for major IT-based manufactured products such as semiconductors and cellular phones.<sup>39</sup> In addition, Toshiba, which holds the core technology patent for satellite mobile broadcasting, imposed a two percent royalty on all handsets to be used for broadcasting services in Korea.<sup>40</sup>

As the importance of standard technology increases, the only solution for Korean government and private sectors is to increase the R&D investments and to present home-grown technologies to international organizations that set international standards for the global IT markets. "If we initiate standard technology, we can be first in the product markets and earn royalties too," said Lee Hee-gook,

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<sup>39</sup> Choi Ji-young, "Royalty Payments US\$2.7 billion in 2002," *The JoongAng Ilbo*, Seoul, ROK, June 6, 2004

<sup>40</sup> Yum Tae-jung, "Toshiba To Cut Royalty on Mobile Broadcasting," *The JoongAng Ilbo*, Seoul, ROK, June 3, 2004

president of LG Electronics Institute of Technology.<sup>41</sup> In 2001, the Korean government invested roughly one billion U.S. dollars in IT R&D, about the same amount as Germany. Korean private sector R&D in the IT industry is estimated to be around 7.2 billion PPP dollars, placing Korea third after only the United States and Japan. This notwithstanding, in 2003, among 19,455 applications registered with the International Organization for Standardization and International Electro-technical Commission, only seven were recognized as being composed entirely of technology developed in Korea. Another 63 were recognized as being standard technologies developed jointly with foreign companies. Although the current scale is still small, some companies have started to collect royalties from foreign countries for certain technologies.<sup>42</sup> Technology standards are vital to adding value and improving overall profitability, and Korean IT firms are beginning to appreciate that.

Third, substantial dependence on exports to specific regions exposes Korean IT industry to unpredictable geopolitical risks and macroeconomic cycles in the areas beyond its control. Korea's major IT markets are located in the United States, Japan, and China. China continues to be Korea's largest information-technology export destination, with the shipments reaching US\$1.6 billion in July 2004, up 25 percent from July 2003. Semiconductor sales to China rose 45.9 percent to US\$ 540 million, while mobile-

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<sup>41</sup> Chang Se-jeong, "Korean Companies Eye Tech Licensing," *The JoongAng Ilbo*, Seoul, ROK, April 13, 2004

<sup>42</sup> For instance, five companies, including Samsung Electronics, LG Electronics, and Panatech & Curitel, say they may receive \$10 million in 2004 and \$50 million in 2005 for royalties on MPEG-4, a technology used to compress digital video. A segment of the core technology for MPEG-4 was developed by a Korean company and was selected as an international standard in 1999.

phone sales increased 11 percent at US\$ 360 million. Exports to the United States rose 37.5 percent from July 2003, to US\$ 1.3 billion in July 2004. July 2004 shipments to Japan were at US\$ 1 billion and US\$ 480 million.<sup>43</sup> China's intentions to slow down its economy, protracted recession in Japan, the U.S. war in Iraq, and rise in the U.S. interest rates could possibly reduce demand for Korea's IT products and services.<sup>44</sup> But, Korea strives hard to diversify its export base and develop new overseas markets by pushing its IT products in Europe, Latin America, and Africa. Korean IT exports to Europe topped one billion U.S. dollars in July 2004, while IT exports to the newly emerging markets such as Brazil and Africa reached US\$ 100 million (up 249 percent) and US\$ 23 million (up 33.5 percent), respectively.

Finally, the fundamental structural weakness of the Korean IT industry is the relatively small size of its domestic market and consequent rapid saturation in domestic demand for IT products. Korean fixed-line telecom market is already saturated; mobile telecom market is saturated; the broadband and mobile Internet markets are near saturation; PC and peripherals markets are saturated; digital broadcasting market is rapidly growing; and enterprise and computing software development markets are near the saturation point. To overcome this shortcoming, Korean IT companies must increase the size of the market, relying on exports as the main driver of their growth, which requires more foreign direct investment and raises the uncertainty

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<sup>43</sup> The export of information and technology products topped US\$6.19 billion in July 2004, up 30.8 percent from a year ago. See Baek Kang-nyeong, "IT Exports Top US\$6 Billion in July," *The Chosun Ilbo*, Seoul, ROK, August 5, 2004

<sup>44</sup> Kim Tong-hyung, "Heavy Dependence On Foreign Components Seen As Threat To Overseas Sales," *The Korea Herald*, Seoul, ROK, August 6, 2004

regarding future returns on their investments. They also have to innovate incessantly by offering new products and services to their domestic consumers, which requires large R&D and high marketing expenses.

## **Conclusion**

Information technology connects individuals, corporations, and government bureaucracies via networks, thereby facilitating the production, distribution and consumption of information within the whole society and economy. The information and communication sector is a dynamic industry with high risks and returns. It is characterized by technological innovations and short product cycles. IT markets quickly reach saturation points and need rapid substitution. Flexibility, innovation, and investment in R&D are key elements to growth and to building competitiveness in the IT industry on a global scale.

In the 1990s, the IT industry grew three times faster than the ROK GDP as a whole. The IT industry's contribution rate to the ROK GDP growth stood at 50.5%, and 37.1% to the ROK exports in 2003. The development of the IT industry resulted in diverse spillover effects such as activating e-commerce and m-commerce, digitizing the contents industry, and revolutionizing distribution channels.

In November 2002, the e-Government was officially launched in Korea. Today, eleven e-Government initiatives, including Government for Citizens (G4C) System and Government e-Procurement (GePS-G2B) System, allow the general public and the private sector to receive government services and access personal and business records stored in the government databases via the

Internet.<sup>45</sup> E-commerce, both B2B and B2C (e-Retailing), grows in leaps and bounds. Financial transaction services, including Internet banking and online securities trading, are booming. M-commerce, especially payment for goods and services via mobile telephones, is on the rise, too.<sup>46</sup>

The IT revolution interconnected and computerized the entire nation, digitized the content of its communications, and allowed Koreans to do business, participate in social and political activities, and live their daily lives on the go and in the world of virtual reality. Korea's unprecedented leap into the information age and rapid construction of the knowledge-based society spurred by the IT revolution has become a model to emulate for the rest of the world.



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<sup>45</sup> See “*E-Government in Korea*,” National Computerization Agency, Seoul, ROK, December 2002

<sup>46</sup> See “White Paper Internet Korea 2003,” National Computerization Agency, Seoul, ROK, July 2003